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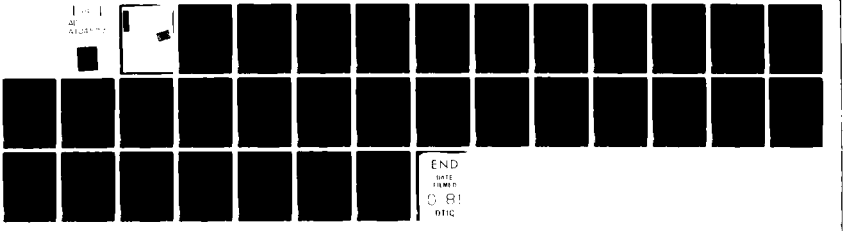

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A PRACTICAL METHODOLOGY FOR IDENTIFYING IMPEDIMENTS TO PRODUCTIVITY

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The methodology followed by NAVPERSRANDCEN in conducting an investigation of impediments to productivity at five Navy industrial facilities in 1980 is described in detail. The methodology included unstructured individual interviews, structured group interviews (using the nominal group technique), and open-ended questionnaires. General instructions for conducting interviews, preparing questionnaires, obtaining samples, and evaluating responses are also provided.

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FOREWORD

This effort was conducted under Task Area ZF62-521-001 (Manpower and Personnel Technology), Work Unit 018-03.03 (Productivity Measurement Techniques). Its purpose was to provide information on methods that might be used in determining impediments to productivity, particularly the method used by NAVPERSRANDCEN in conducting an investigation of impediments to productivity at five Navy industrial facilities (NPRDC SR 81-2). Results are intended for use by federal managers and supervisors as resource information and general guidelines in conducting impediment identification studies in their own organizations.

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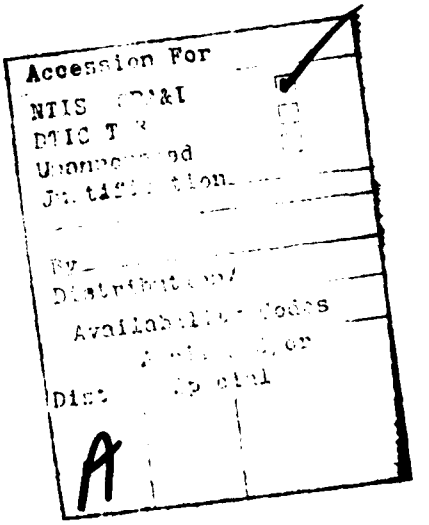

SUMMARY

Problem

In 1980, the Navy conducted a study to investigate impediments to productivity in five Navy industrial facilities. During this study, a method for identifying impediments was developed that may prove useful to other organizations. Although that method was described briefly in the study report, it must be described in greater detail before it can be usefully employed.

Objective

The objective of this effort is to provide information on methods that can be used in conducting a study defining impediments to productivity, particularly the method used by NAVPERSRANDCEN in the 1980 study of five Navy industrial facilities..

Results

Six methods of gathering information for use in determining impediments to production at a Navy industrial facility were described, along with their advantages and disadvantages. These methods are structured questionnaires, unstructured questionnaires, individual structured interviews, individual unstructured interviews, group structured interviews, and group unstructured interviews. Selection of the appropriate method depends on the size and educational background of the population, composition of the research team, and time available to conduct the study.

The methods used in the NAVPERSRANDCEN study were described in detail, along with the rationale used in selecting them. These methods were unstructured individual interviews, structured group interviews, and unstructured questionnaires.

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INTRODUCTION

Problem

The Navy, along with the rest of the nation, has been concerned over a decline in productivity. Therefore, in 1980, the Chief of Naval Material tasked the Navy Personnel Research and Development Center (NAVPERSRANDCEN) to conduct a study to determine impediments to productivity at the Naval Material Command industrial facilities. During this study, a methodology for identifying impediments was developed that may prove useful to other organizations interested in a similar endeavor. Although this methodology was described briefly in the study report (Broedling, Crawford, Kissler, Mohr, Newman, White, Williams, Young, & Koslowski, 1980), it must be described in greater detail before it can be usefully employed by other organizations.

Purpose

The purpose of this report is to describe the various methods found to be useful in identifying impediments, particularly the methodology used by Broedling et al. Results are intended to provide a guide for others in investigating impediments to productivity in their organizations.

Background

Historically, efforts to increase productivity have focused on hard technology. Attempts have been made to reduce production costs through various labor-saving devices, more efficient production methods, and improved workflow. Navy organizations, however, are beginning to recognize that personnel approaches such as incentives and feedback can significantly affect productivity. Without modifying hard technology, programs using combinations of incentives and feedback have had positive effects on such aspects of worker productivity as increased quality and quantity of product, reduced costs, decreased absenteeism and turnover, and fewer grievances (Katzel, Beinstock, & Faerstein, 1977).

One promising approach to productivity that has not received much attention is that of removing impediments to productivity--those things that keep people from doing their jobs as well as they could. Although there are some reports that could be interpreted as dealing with impediments to productivity (Duerr, 1974; Patton, 1974; Sherif, 1976; Sutermeister, 1976), they actually concern the observations and situational interpretations by the authors, rather than an empirical approach such as that used by Broedling et al.

GENERAL PROCEDURES FOR INFORMATION GATHERING

This section provides an overview of information gathering techniques and processes. It describes a number of potentially useful tools and their relative advantages and disadvantages. Table 1 presents decision points that arise in planning an impediment identification effort; Figure 1 flow-charts the various stages in conducting such a study.

Table 1

Decision Points in the Design and Planning of an Impediment Identification Study

Item	Individual Interviews		Group Interviews		Questionnaires	
	Unstructured	Structured	Unstructured	Structured	Unstructured	Structured
Question Design	N/A	Language level Wording and ordering Response alternatives	N/A	Language level Wording and ordering	Language Wording	Language Wording and ordering Response alternatives
Sampling	Total group Key people (e.g., Dept. Heads)	Total group Key people (e.g., Dept. Heads)	Simple random Cluster Stratified	Simple random Cluster Stratified	Simple random Cluster Stratified Total group	Simple random Cluster Stratified Total group
Administration	Schedule time and place	Schedule time and place	Schedule time and place Notify participants	Schedule time and place Notify participants	Group Individual Mail/drop-off points	Group Individual Mail/drop-off points
Analysis	Qualitative	Qualitative Quantitative	Qualitative	Qualitative Quantitative	Qualitative	Qualitative Quantitative
Use	Exploratory efforts In-depth probing	Detailed questions	Exploratory efforts Group interactions	Exploratory efforts (limited range) Group Interactions	Larger samples Exploratory efforts	Larger samples Detailed questions and responses Statistical analysis

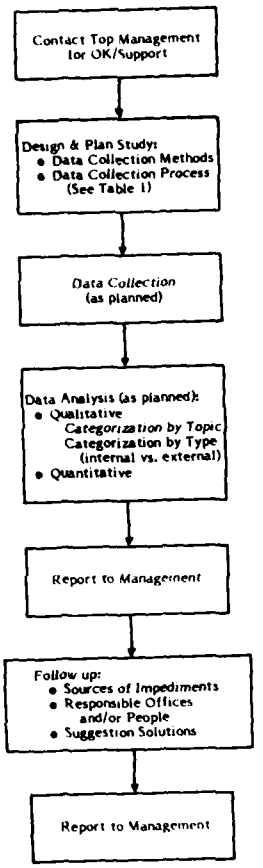


Figure 1. Flow chart of activities involved in identifying impediments to productivity.

Individual Interviews

One of the best ways to get information from people is to talk with them individually. Such talks can range from structured interviews in which several specific questions are asked, to unstructured interviews in which one basic question is asked and further questioning is guided by responses. Structured interviews require planned questions based on detailed knowledge of the subject, which, unfortunately, is seldom available in an initial exploratory effort. However, unstructured discussions can yield much useful information.

An advantage of individual interviews is that the person interviewed can be contacted later for follow-up information. A major disadvantage, on the other hand, is the time required. Each interview may run over an hour, and input from 25 people might take a full week. Also, differing opinions and conflicting information from individual sources may necessitate follow-up interviews to reconcile the differences.

Another potential problem of interviews is the need for anonymity and objectivity. Ideally, to encourage candor in the interviewee, the interviewer should have little personal interest in the organization and in the results of the study. Respondents may not be completely honest in their answers if they feel such answers could affect them

adversely. Therefore, although individual interviews may yield useful information, they are not time-efficient and present difficulties for an organization that must rely on in-house interviewers.

Group Interviews

An alternative to the time-consuming personal interview is the group interview, which, because of its emphasis on participation, captures group "wisdom." The group interview is time-efficient, obtaining answers at one session from many individuals, with the added benefit that answers reflect analysis of the ideas presented by other members of the group.

Group interviews, like individual interviews, can be structured or unstructured. In the unstructured group interview, a question can be answered by anyone in the group. Interviewers participate in the discussion only to clarify issues, to facilitate discussion, to bring the discussion back to the topic, or to keep the group from being dominated by one or more persons.

Structured group interviews typically require more interviewer participation than do unstructured group interviews. Interviewers try not to interfere with the content of the discussions, but try to lead the group through several structured information gathering phases.

One useful technique for conducting structured group interviews is the nominal group technique (NGT) (Delbecq, Van de Ven, & Gustafson, 1975), which is used to generate answers to a single important question. In the NGT, a group of from 8 to 14 persons from one functional area of an organization (e.g., a department or a division) is interviewed. A combination of personnel from widely different organizational levels or functions is not recommended because input in one session from persons at different levels (i.e., management, first-line supervision, and nonsupervisors) or from people with very different jobs may involve perspectives so different that the group process is inhibited. Some combination of not too diverse organizational levels (e.g., first- or second-line supervisors or foremen) may provide a useful group perspective.

The actual steps in conducting an NGT group interview are listed below and described in detail in Appendix A.

1. The question to be asked of group members is formulated. This question must be designed to generate specific information.

2. A meeting room is prepared and a meeting time set.

3. Participants are selected and a meeting time and place are announced.

4. Interviewers are introduced and the meeting purpose outlined.

5. The topic question, printed on lined paper, is given to members of the group.

6. Each member is asked to take 5 minutes to think about the question and to write down ideas.

7. Each member is asked in turn for an idea, and the ideas are listed on a blackboard. This phase continues until all unique ideas are recorded. (This step is for mere presentation of ideas. Detailed discussion of ideas is not permitted at this time.)

8. Each idea is discussed so that all group members and the interviewer understand it.

9. Each member is requested to list the three ideas he or she considers most important on a 3" by 5" card.

10. The interviewer tallies and rank orders the votes and presents the ideas back to the group in this order for comments and discussion.

There are several advantages to this method. First, it is very efficient in time--much information can be obtained in a very short period (each group session takes 2½ to 3 hours). Second, the ideas generated are discussed and explained thoroughly, benefitting both group members and the interviewer. Third, a list of ideas, or answers, is obtained from the group. Fourth, the relative importance of each idea is established by the group. A potential disadvantage, however, depending on the purpose of the interview, is that only one question can be addressed in a session.

A point that must be emphasized regarding any group interview is the importance of taking detailed notes. Since the interviewer is absorbed by the interview process, someone independent of the interview procedures should take detailed notes. These notes will prove valuable later because they add substance to the ideas generated by individuals and ensure that they are accurately recorded. The interviewer should not rely on memory to reconstruct the detail of the topics generated. (Detailed notes are equally important in the individual interview situation, although it is usually a matter of personal preference whether the interviewer or another person takes them.)

It is also important to read, embellish, and reorganize interview notes as soon after the interview as possible to avoid the loss of subtle or unrecorded pieces of information that add depth and are needed to fill out abbreviated information. An interview form that allows the restructuring of the interview data into particular topic areas is a useful method for reorganizing information (see Figure 2).

Interview Summary Sheet

Organization _____ Date _____

Department _____ Interviewer _____

Person Interviewed _____

Position _____

Summarize what this person saw as impediments.

_____

_____

_____

_____

What were the causes of each?

_____

_____

_____

_____

What solutions were suggested?

_____

_____

_____

_____

Other comments:

_____

_____

_____

_____

Figure 2. Example of an interview summary sheet.

Questionnaires

Like interviews, questionnaires can be either structured (fixed response) or unstructured (open-ended response). Structured questionnaires ask specific questions and provide response alternatives. For example, if respondents are asked, "To what extent do you feel equipment problems keep you from doing your work as well as you could," their responses might be made on a structured scale ranging from "To a very great extent" to "Not at a'l." Similar to structured interviews, structured questionnaires are most appropriate when you have specific questions and when the range and types of possible answers are known.

Open-ended questionnaires ask more general questions and allow respondents to write in their answers. An example of an open-ended question would be, "What do you see as things that keep you from doing your job as well as you could?" If the investigation is of an exploratory nature, open-ended questions are more useful than structured questions because they provide an opportunity for all possible responses.

Questionnaires have a number of advantages over interviews:

1. Information can be obtained from many people in a short time.

2. Based on the distribution of responses, researchers can estimate the relative importance of various issues.

3. Information can be obtained from many people in many places without an interviewer.

4. The anonymity of respondents can be preserved.

One disadvantage of questionnaires is that some of the qualitative information that can be obtained by probing and asking for clarification in interviews is lost. This is a lesser problem with open-ended questions that allow respondents to express themselves freely.

If questionnaires are used, the most effective method of administering them must be determined. One of the most popular methods is to hand out or send out questionnaires and to provide a means for their return (e.g., a stamped and self-addressed envelope or a return box into which the completed questionnaires may be dropped). The problems with this approach are that (1) the respondent's answers may not be solely his own, (2) return rates may be so low that respondents cannot be considered representative of the population, and (3) those who respond may be different in some way from those who do not. An alternative procedure is to ask selected employees to attend a group administration session at a given time and place. At each session, a person familiar with the questionnaire can be present to answer questions. This provides certain guarantees on response rate and gives the respondent an opportunity to ask questions if anything about the questionnaire is unclear.

The design of the questions and the way they are presented are critical. It must be decided whether to use unstructured or structured questions, and the wording must be chosen carefuly. The techniques of administration and the possible types of analysis also should be considered.

Questions should be clear. Such words as "effective" that can be construed in various ways by different people should be avoided. An "effective man" could imply that he is accurate, efficient, responsive, productive, or none of these. Items that are really two

questions within one (e.g., "What are the things about your job that you dislike or would give you cause to look for another job?") should be avoided. The respondent may have difficulty answering such a question meaningfully. Also, "leading" questions that can bias the answers should be avoided (e.g., "Why are you dissatisfied with your job?"). This question might elicit a negative response because it assumes the employee is dissatisfied. The question might have been worded, "Are you dissatisfied with any aspects of your job?" and followed with the question "If so, what are they?"

In designing questions, consideration must be given to the group from which the respondents will come. Alternate language versions of the question should be available for some groups (e.g., Spanish), and the level of education of the group should be considered. Questions for a group of professional personnel should be tailored differently than those for a group of people who have not completed high school.

Questions should be tested for effectiveness by giving them to a few members of the test group to see if they are interpreted as intended. Those people given the test questions, however, should not be included in a later group because experience with the questions might bias their responses.

In designing questions, methods of analysis and compilation should be considered. If computer analysis is to be used, question construction should facilitate keypunching or remote data entry by numbering questions consecutively and by using numbers for response alternatives rather than letters; computer specialists should be consulted for guidance in question design.

Sampling

The first step in selecting a sample involves defining the population of interest. For determining impediments to productivity, the population will be the group from which the information is to be obtained--a population that may range from the entire work force to a single shop.

The population of interest may be small enough to allow everyone to be included in the data collection. More often, however, the population of interest will be too large for all members to be questioned. In such cases, some members will be selected through an objective sampling procedure that ensures the smaller group is representative of the whole population. The three most common methods of objective sampling are simple random sampling, cluster sampling, and stratified sampling. Of the three methods, simple random sampling is the most common.

Technically, simple random samples are defined as those in which every element (person) in the population (1) has an equal chance of being selected, and (2) is chosen independently (one person's chance for selection does not depend on that of any other person's). An example of this type of sampling would be to place all possible names of a population into a hat and to pull out one name after another until a specified sample size is obtained. Elaborate procedures for determining the optimal sample size are discussed by Sudman (1976).

A second type of sampling is cluster sampling. Although this method is no more objective than simple random sampling, it is used because, in some instances, it is more time and cost-efficient or because the population is arranged in clusters that should not be disturbed. Cluster sampling involves taking at random whole groups within a population as samples rather than selecting individuals from many groups. For example, if an organization had 50 plumbing teams, 10 of these teams might be selected at random and each member of the 10 teams would be questioned.

A third type of sampling is stratified sampling in which a population is divided into subgroups, or strata, on the basis of some variable of interest (e.g., white-collar vs. blue-collar). Samples are drawn from each strata to ensure that the number of individuals from each level accurately represents the population. If, for example, the organization comprises 2000 blue-collar and 200 white-collar personnel, and 100 of each class is wanted, 1/20 of the blue-collar and 1/2 of the white-collar would be randomly selected.

In most cases, simple random sampling will be most efficient and will most likely provide an unbiased sample. If for some reason, another type of sampling must be done, experts or a text book (e.g., Sudman, 1976) should be consulted.

METHODOLOGY USED IN NAVPERSRANDCEN PRODUCTIVITY STUDY

This section describes in detail the methodology used by Broedling et al., and explains the reasons why various techniques and procedures were chosen.

Description of the NAVPERSRANDCEN Study

In March 1980, a NAVPERSRANDCEN research team began a study of Navy industrial facilities to identify impediments to productivity--"Those things that keep people from doing their jobs as well as they could." Five organizations were studied: a shipyard, a weapons station, an air rework facility, a supply center, and a public works center. These five were believed to be representative of organizations at Navy industrial facilities. The number of employees at the five activities ranged from 1087 to 6091. Over 97 percent were civilian.

The study involved the following six stages:

1. Cognizant officials in the headquarters organization directly responsible for each of the five field organizations were contacted, briefed on the purpose and goals of the study, and asked to provide information on potential impediment areas that might be investigated during on-site visits to the field activities.

2. Five research teams independently visited each of the field activities to gather information on perceived impediments to productivity. The teams used a variety of information gathering techniques to be as comprehensive as possible within the time limits of the study.

3. Since the number of issues raised as potential impediments at the different activities was greater than could be pursued in detail during the allocated time, they were pooled and classified in three categories.

   a. Impediments that appeared to be within the control of local field activity management (e.g., internal communications, local policies).

   b. Impediments common to more than one field activity but that appeared to be beyond the control of local management (e.g., processing security clearances).

   c. Impediments that were unique to a particular organization (e.g., shipyards) but were beyond the control of local management (e.g., propeller repair waivers).

4. The issues categorized during the third stage of the study were reported to the management at respective activities. Impediments primarily under local control were

turned over to management for further assessment and/or action. For impediments beyond local control, managers were asked to indicate (a) whether they were important enough to be pursued at higher levels, and (b) whether they could be substantiated through concrete documentation within the command (this was done to ensure that the identified impediment was more than one person's subjective impression). Final selection of impediments was by mutual agreement between local management and the research team. Top management identified key individuals in their commands who had cognizance over the problem areas. Researchers contacted these individuals to gain a more complete understanding of the impediment, obtain documentation, and identify agencies and individuals at higher levels for further action.

5. To obtain information on the impediments beyond the control of local management, the researchers contacted cognizant Navy organizations, other DoD activities, or, where necessary, such outside agencies as the Office of Personnel Management (OPM). During these contacts, researchers attempted to identify the source of the impediments, and to understand the rules, regulations, and decision-making processes that resulted in the impediments at the field activity level.

6. To determine whether the impediments identified at each type of field activity occurred at other activities, researchers contacted managers at similar activities and asked them (a) whether the impediments occur at their command, (b) to what degree the listed impediments affected their command, and (c) whether their command was affected by other impediments not listed.

Information Gathering Techniques

During information gathering, emphasis was placed on a systematic approach to allow input from every major department and level in the participating organizations. Several factors influenced the information gathering methods at each organizational level, however. For example, individual interviews were more practical with upper management where there were relatively few individuals, and questionnaires, at the worker level where there were many individuals. The mission of the organization also influenced information gathering techniques, because disruption of the normal work flow had to be kept to a minimum. As a result of the need to defer to the optimal functioning of the organization, the most effective information-gathering technique was not always feasible.

The three methods used to obtain information on impediments to production were unstructured individual interviews, structured group interviews (using the NGT), and open-ended questionnaires. These techniques are explained below:

1. Unstructured Individual Interviews. The relatively small number of upper managers made it possible to obtain information through unstructured interviews from virtually all members--the commanding officer, executive officer, department heads, and other key personnel. Individual interviews were used because it was difficult to schedule group sessions at this level, and because it was thought that managers would have a large amount of information to convey. Also, the very different perspectives on problems by managers with separate responsibilities might make managerial group sessions unproductive.

Managers participating in the interviews were usually asked to describe what they thought were the major factors or impediments that kept them and their subordinates from accomplishing their jobs in the most efficient manner. Since individuals were assured that their responses would be confidential, they were very open in their responses in almost all instances. Responses were probed for detail and clarification.

2. Group Interviews. Group interviews were conducted with members of the production department, or its equivalent, in each of the organizations. The nominal group technique was used for these interviews because: (a) a great deal of input was sought in a short period of time, (b) it was thought that members in a department would have common interests and problems, and (c) many ideas were wanted in response to one question. Each group contained a sample of middle managers (division heads) and first-and second-level supervisors.

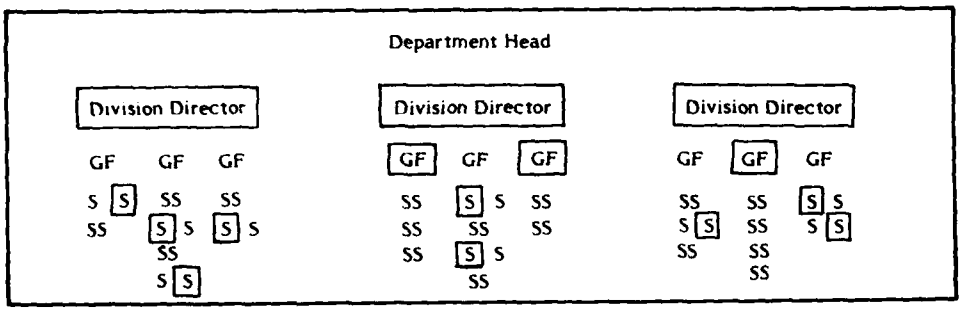
3. Questionnaires. An open-ended questionnaire was administered to a random sample of the workforce of the production department in each organization participating in the study. Group interviews were not feasible because of the large number of individuals at this level. A copy of this questionnaire is included in Appendix B.

Investigative Procedures

Whatever the method used (interview or questionnaire), the same focal question was asked: "What are the things that keep you from doing your job as well as you possibly could?" Also, participants were asked for possible solutions to problems and to name the office or person having control over the problem situation.

Total population sampling was used as the strategy for top managers. A scheduled unstructured interview was conducted by two researchers with each manager, usually in the manager's office.

The sampling for NGT interviews was more complicated. Cross-level groups were constructed that included a department or division head and a sample of the first- and second-level supervisors, taking care that individuals and their immediate supervisors did not participate in the same group session--a constraint that excluded a number of potential participants. Figure 3 shows the selection procedure. The number of individuals in the groups was established as 12, and, to allow a substitute in case of an absence, 13 were selected. More than one group interview session was conducted in exceptionally large departments. (A detailed description of the NGT interview procedure is presented in Appendix A.) In very small departments where less than six participants per group could be arranged, individual interviews were used with key department members.



Notes.

1. GF = General Foremen and S = Supervisors/Leaders.

2. Persons holding positions enclosed by squares would be asked to attend an interview session.

Figure 3. Sample section of members for a NGT group interview.

An NGT interview was also used with one group of middle managers from all departments at a single site (i.e., across departments instead of across levels within a department). The information, although highly useful, lacked the usual depth in description and comment from many of the group members. For this reason, no other groups of this type were employed.

Random sampling from each production department workforce roster was used to select respondents to the questionnaire. Selected personnel were asked to attend scheduled questionnaire administration sessions comprising no more than 25 persons. Group administration of the questionnaire was chosen because it was thought that (1) workers might not take time to fill out and return the questionnaires on their own, and (2) it would ensure that a representative sample of the production workforce responded.

Data Organization

Many times, the same impediment to production was described by several individuals, each from different perspectives. In such cases, the information obtained was consolidated to provide a composite description of the impediment that affected the entire organization.

Before the final description of any one impediment could be written, the information from individual and group sessions and from questionnaires had to be organized by topic. As a first step, the questionnaire data from each of the five organizations was categorized for each organization by the researchers responsible for the data collection. An example of several categories generated from questionnaire responses at one activity and an outline of a method of categorization are presented in Appendix C. Interview notes from individual and group interviews were incorporated into the categories created for the questionnaire data by placing like topics in existing categories, or creating new categories when necessary, to produce a summary of each topic. Impediment topics similar across organizations were then merged. Each impediment common across at least two organizations was assigned to an individual in the research team for further investigation. Items unique to a single organization were the responsibility of the researchers working in that organization.

Follow-up Investigations

On compilation of the impediment topics, it was recognized that some elements in the descriptions of some impediments were either missing or simply not clear. Thus, members of the research team (1) returned to the original sources of information in an attempt to clarify or complete the information or (2) conducted follow-up interviews as far up the chain of command as necessary. In addition to providing information, these follow-up interviews were useful in verifying the existence or severity of problems and in generating ideas for their correction.

Once impediments were identified and verified as thoroughly as possible, the information was presented to all involved levels of management. Command briefings were presented to all activities involved in the study. Also, system commands involved in the study and the Chief of Naval Material were briefed on items that were thought to be primarily beyond the control of the field activities.

Responses from all levels within the Naval Material Command and from outside agencies such as OPM were reviewed and analyzed to determine what actions could be taken to remedy the impediments.

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APPENDIX A

DETAILED DESCRIPTION OF THE NOMINAL GROUP TECHNIQUE (NGT) INTERVIEW PROCESS

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The nominal group technique (NGT) was developed by Delbecq, Van de Ven, and Gustafson (1975) based on studies in such areas as social psychology, management science, and social work. A "nominal" group is one in which individuals are brought together but typically do not constitute a formal group in the organization. NGT was designed to overcome certain problems associated with other group techniques and has since been used widely in a variety of applied settings, including health, education, industry, and government. NGT participants meet just once; the technique was not designed for use with established groups. The most typical uses for NGT are problem indentification, solution exploration, and priority setting. The NGT process essentially covers: (1) silent generation of ideas, (2) round-robin recording of ideas, (3) clarification and discussion of ideas, and (4) individual voting, rating, or ranking of ideas.

Preparation

Several issues are important in selecting NGT participants. Group members should be interested in or related to the issue to be discussed. They may have experience with either the topic area itself or with education in a field relevant to the topic. The goal is to involve people who are closest to the problem identification or solution.

The heterogeneity or homogeneity of the group is important. Although heterogeneous groups have been shown to be more creative, participants must be homogeneous enough to speak a common "language"--that is, while it is helpful to include individuals with varying perspectives, they must be able to talk about the issues in common terms. It is most effective to select individuals within an organization from the same functional area (e.g., department or division) to obtain a workable specificity of responses. While it is beneficial to chose members from several levels within a department (e.g., supervisor, section head, and division head), subordinates and their direct supervisors should not be included in the same group if honesty and frankness are expected and inhibitions are to be prevented.

An alternative to selecting group members from a functional area is to select the members from various functional areas but at approximately the same level within each. Such a horizontal group can effectively tap the perceptions of a number of segments within the organization and, at the same time, eliminate problems caused by supervisors and subordinates being in the same group. The results of an interdepartmental nominal group, however, may be less practical than those obtained from intradepartmental groups.

Group size can vary from 7 to 15, with approximately 10 being the optimal number. Too few members may result in a lack of interaction, and too many may take too much time. To adequately assess the perceptions or views of an organization, several nominal groups must usually be conducted. These may be either vertical (several groups within different functional areas), horizontal (several groups across functional areas but at different levels), or a combination of the two. Individuals should not be asked to participate in more than one nominal group to avoid repetition of ideas and participant boredom.

Question Formulation

The NGT topic question must be phrased to focus the attention of the group on one salient idea. The objective of the meeting and the type of responses desired (in terms of both level of abstraction and depth versus breadth) must be considered. The question

should successfully elicit the type of responses sought but should not lead participants in any specific way. Illustrations of appropriate answers may prove helpful, but caution should be taken not to restrict responses to the area of the example unless that is the desired result. An example of an appropriate NGT question would be, "What are the things that keep you from doing your job as well as you could?"

Selecton of Leader

A leader of a nominal group must (1) understand the NGT process, (2) possess the self-confidence or experience to lead a group, and (3) be accepted by the group members as the leader. Both understanding and experience may result from observing someone else run an NGT meeting and/or by conducting a trial nominal group in a nonthreatening situation. If the group leader is an organization member, acceptance may result from status or experience. Leaders from outside the organization are usually presented as group leaders and are accepted as a natural course.

The Nominal Group Technique Process

In beginning an NGT meeting, the group leader must convey various things to the participants. He or she should indicate the importance of both the group objective and the contribution of the individual. In addition, the purpose of the meeting and the use to which the results will be put should be briefly discussed.

1. Silent Generation of Ideas. In Step 1 of the NGT, a copy of the question is given to each participant and is read aloud by the leader. Participants then independently write their answers to the question. They should be encouraged to record ideas in brief phrases and to work quietly and independently. Adequate time should be allowed for thinking and writing. Typically, this step takes 5 to 10 minutes.

By using independent generation of ideas, problems caused by competition among group members, conformity pressures, and dominance by a few participants are overcome. Individuals are given time to record all their ideas without interruption or distraction.

2. Round-Robin Recording of Ideas. In Step 2 of the NGT process, the ideas of all group members are recorded on a flip-chart or a blackboard. In round-robin recording, each participant in turn gives an idea from his list, and the procedure is repeated until all ideas have been recorded. Participants are asked to skip duplicate ideas.

This procedure has many benefits. Participation by all is assured and this participation behavior pattern is set. The method also increases depersonalization of ideas. Ideas are separated from personalities, which, in turn, limits competition among members. "Hitchhiking" of ideas is also encouraged--that is, an idea by one participant may induce an idea from another member, to be brought out at his next opportunity. The accumulating list of ideas serves as a useful early group reward by showing the array of generated responses.

As each idea is expressed, it is recorded in the brief words or phrases used by the participant. If, however, a participant gives a lengthy response, the leader can ask for rephrasal, placing the burden for briefness back on the individual. Although variations on a theme are admissable, duplicate items are not. If one is proposed, the leader should either require the participant to justify it as a variant or drop it from the list. Because the group's attention may wander at this point, it is important to record ideas quickly and to complete this step without delay.

3. Serial Discussion of Ideas. In Step 3, each idea in Step 2 is discussed and ambiguities are removed. The leader reads aloud each entry, asks the group if there are any questions or statements of clarification, and paces the discussion to cover all items in the time available. Individuals should not be called upon to clarify or defend their ideas, but they will often voluntarily speak up.

The purpose of this phase is to provide a common understanding of each item, not to argue about the merits of an item or to convince others that one item is better than another. The discussion should include comments on the exact meaning of an idea and the logic behind it. The leader is responsible for avoiding arguments and aggressive interactions.

4. Evaluation of Items. Since most NGT meetings will generate 15 or more items, some means is often desired to determine the relative importance. The specific means can vary. Delbecq et al. (1975) recommend rank-ordering a specific number of items in terms of their importance. Each member selects several (usually five) items from the full list that are thought most important and places each on a separate 3" by 5" card. Table A-1 presents the results of a nominal group conducted by Broedling et al., (1980). An alternate evaluation method requires participants to rate items on a scale of, perhaps, 1 to 5 with 1 indicating not important and 5 indicating very important.

The simplest evaluation method requires group members to choose the five most important items. The items receiving the most votes are considered important. While this is easiest and most straightforward, it provides less information than either of the other methods.

The final step of the NGT process is the feedback of evaluation results to participants. Although the evaluation technique is a matter of the personal preference of the researchers or may be dictated by the research goal, it is important that some evaluation method be applied. The evaluation strengthens member acceptance of the results of the effort, and the participants take proprietary pride in the list of most important items.

Summary

The nominal group technique provides a useful way to conduct structured group meetings and to overcome many problems associated with group interviews. NGT has been used successfully in many research and applied settings. NGT meetings conclude with a sense of closure and accomplishment as well as interest in the future of listed items. Participants express positive reactions to the process itself and to their involvement in the group.

Table A-1

Sample Results From One NGT Session Conducted to *Identify* Impediments to Productivity
(Total Number of Participants: 12)

Impediment	% of People Who Chose Impediment as One of Five Most Important	Number of People Who Chose Impediment as One of Five Most Important
1. Manpower ceiling restrictions	75	9
2. Equipment deadlines too long	42	5
3. Lack of parts needed to service vehicles and equipment	33	4
4. Ceiling restrictions	33	4
5. Need larger cranes	25	3
6. Cannot hire enough qualified mechanics	25	3
7. Safety regulations	25	3
8. Lack of organization/communication within the activity	25	3
9. Lack of enough tools and equipment	16.5	2
10. Limited working area (garage area)	16.5	2
11. Lack of enough vehicles above 2 tons	16.5	2
12. Poor radio service--can't hear what's transmitted	16.5	2
13. Not enough qualified people in certain grades	16.5	2
14. Lack of MVO 7s and 8s	16.5	2
15. Setting up personnel registers takes too long	16.5	2
16. Vehicle allowance is too low	16.5	2
17. Lack of material needed for scheduled jobs	8	1
18. Lack of information pertaining to some jobs	8	1
19. Lack of vehicles, 2-ton and below	8	1
20. Contracting for out-of-town runs	8	1
21. Lack of enough overhead personnel in transportation	8	1
22. Poorly maintained heavy equipment	8	1
23. Abuse of 45-day compensation pay	8	1
24. Response time on parts/equipment ordered	8	1
25. Abuse of sick leave	8	1
26. Negative attitudes of personnel toward management	8	1

APPENDIX B

NAVY PRODUCTIVITY QUESTIONNAIRE

NAVY PRODUCTIVITY QUESTIONNAIRE

The purpose of this study is to obtain information from employees regarding their work. It is anticipated that the results derived from your responses will be used to improve the quality of working life and productivity in Navy organizations.

For this survey to be of value, it is necessary that you be as frank and thoughtful as possible in responding to these questions.

Thank you for your cooperation.

PRIVACY ACT STATEMENT

Information concerning your opinions is requested under authority of 57 USC 301 as reflected in OPNAV Notice 5450 of 17 April 1975. This information will be used by NAVPERSRANDCEN to recommend methods of enhancing organization effectiveness. The information provided will be combined with that provided by other individuals. Individual responses will not be made available to anyone. You are not required to provide this information; your participation is voluntary.

Developed by:

Navy Personnel Research and Development Center
San Diego, California 92152

Check one:

(1) ___ Nonsupervisory

(2) ___ Supervisory

Pay Category:

(1) ___ WG

(2) ___ WL

(3) ___ WS

(4) ___ GS

(5) ___ Military

Grade:

(1) ___ 1 to 4

(2) ___ 5 to 8

(3) ___ 9 to 11

(4) ___ 12, 13

(5) ___ 14 or above

(6) ___ Military rate or rank

How long have you worked in this organization?

___ years

What department are you in?

The next questions are followed by answer spaces. Please WRITE your answers in the spaces provided.

Q1. What do you see as the most important problems that keep you from doing your job as well as you could?

Answer 1. _____

Answer 2. _____

Answer 3. _____

Answer 4. _____

Answer 5. _____

Now that you have listed what you feel are problems, would you please use the following spaces to write what you see to be the cause(s) and solution(s) of each.

Problem 1. Cause: _____

Solution: _____

Problem 2. Cause: _____

Solution: _____

Problem 3. Cause: _____

Solution: _____

Problem 4. Cause: _____

Solution: _____

Problem 5. Cause: _____

Solution: _____

Your participation is appreciated.

APPENDIX C

QUESTIONNAIRE RESPONSE CATEGORIZATION PROCEDURE

CATEGORIZATION PROCEDURE

A primary concern is development of an objective category scheme. A good way to do this is to have more than one person categorize the responses. Three classifiers are optimal. The classifiers need not be intimately familiar with the subject matter, but some familiarity is helpful.

The steps in this procedure are as follows:

1. Put each response in a form that can be sorted (i.e., one answer per card).

2. Randomly divide all responses to a question evenly among the three classifiers.

3. Give classifiers a copy of the question and ask them to independently sort the batch of answers into as many categories as they feel is appropriate, putting ideas that go together in one stack.

4. Once each classifier has a category scheme, the responses are again divided, this time with a fourth person to act as arbitrator. The four decide upon one joint category scheme. The arbitrator resolves differences between classifiers on what categories might be combined, created, or eliminated.

5. Once a joint category scheme is produced, responses are redivided among the three classifiers and resorted to fit into the new scheme. Responses that do not fit into any category are put into a "miscellaneous" category.

6. When categorization is complete, the number and types of categories are informative, and the responses in each category are meaningful.

7. Once categories are formed and labelled with descriptive category titles, lists of each category and the responses that fall within it are prepared.

Table C-1 is a sample of the categorization of responses to the question, "What do you see as the most important problems that help you from doing your job as well as you could?" The categories were established by NAVPERSRANDCEN researchers during their study.

Table C-1

Sample Categorization of Questionnaire Responses

Category	Worker	Supervisor	Department Code
Material			
Unable to get parts.	X		7
Too often parts needed come in wrong two and three times; unnecessary delays.	X		7
Takes too long to get parts.	X		7
Not enough parts in stock and takes too long to order them--poorly trained counter people.	X		7
Lack of material and parts.	X		5
Takes too long to get material from local supply.	X		5
Need to be notified when material comes in.	X		5
Lack of understanding from supply when parts are needed.	X		5
Time wasted for material; need direct buying.	X		5
Material is hard to work with; wait too long for it.	X		5
Inadequate material substitutions; work takes longer.	X		5
Getting things you need on the job.	X		5
Nonavailability of repair parts.	X		5
Parts unavailable; should be able to purchase as needed.		X	6
Workers not getting proper parts and instruction books.		X	6
Communication			
Lack of communication.	X		7
Lack of coordination among codes.		X	7
Lack of communication; need weekly meetings.		X	7
Lack of coordination between shops.	X		7
Communication not passing down.		X	6
Facilities			
Need larger working space in shops	X		5
Working area too crowded.		X	5
Rewards			
No one cares about the next guy or gives praise or rewards.	X		5
Wages based solely on rates; no responsibility incentive.		X	7
Noncompetitive Wages			
Wages are too low to get good people.		X	6

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